ZooKeys 29: 1–12 (2009)
doi: 10.3897/zookeys.29.257
www.pensoftonline.net/zookeys

RESEARCH ARTICLE

A peer-reviewed open-access journal
ZooKeys
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Two New Halictine Bees in Miocene Amber from the Dominican Republic (Hymenoptera, Halictidae)

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Academic editor: *Michael Ohl* | Received 24 October 2009 | Accepted 16 November 2009 | Published 11 December 2009

urn:lsid:zoobank.org:pub:E22E3C29-3392-4BA2-B98D-3BBAD6972DC3

Citation: Engel MS (2009) Two New Halictine Bees in Miocene Amber from the Dominican Republic (Hymenoptera, Halictidae). ZooKeys 29: 1–12. doi: 10.3897/zookeys.29.257

Abstract

Two new halictine bees (Halictidae: Halictinae) are described and figured from females preserved in Early Miocene (Burdigalian) amber from the Dominican Republic. *Oligochlora semirugosa* **sp. n.** (Augochlorini) is similar to *O. micheneri* Engel but differs in the shape of the pronotal dorsolateral angle, the partially rugulose gena (entirely imbricate in the latter species), and the sculpturing of the face, mesosoma, and metasomal terga. *Nesagapostemon moronei* **gen. n. sp. n.** (Caenohalictini) resembles *Eickwortapis* in the absence of carinae bordering the dorsal horizontal surface of the propodeum while having the vertical posterior surface encircled. The genus differs from *Eickwortapis* in the much larger and more robust body size (nearly twice as large), the non-slanting and shorter horizontal surface of the propodeum, sculpturing, and pilosity of the hind legs. A second specimen of *O. grimaldii* Engel is recorded and a provisional key to halictid bees in Dominican amber is provided.

Keywords

Apoidea, Anthophila, Halictinae, Tertiary, paleontology, taxonomy, amber, Dominican Republic

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Introduction

Our knowledge of the Dominican amber bee fauna has expanded significantly in the last 15 years. As recently as 1994 the only species on record was the common stingless bee (Meliponini), *Proplebeia dominicana* (Wille & Chandler) (Michener 1982). Since that time there has been a dramatic increase in documented species, representing a diversity of lineages such as the Xeromelissini, Protandrenini, Megachilini, Euglossini, and additional species of *Proplebeia* (Rozen 1996; Michener and Poinar 1996; Poinar 1998; Engel 1999a, 1999b, 1999c; Camargo et al. 2000). Aside from these lineages the most diverse in numbers of species are those bees of the Halictinae (Table 1). While Dominican amber halictines remain rare, a specimen has been found nearly every year on average and bees other than *Proplebeia* about every other year on average. Accordingly, continued exploration should undoubtedly bring to light much more material from which to characterize the previously known species as well as other species as of yet unimagined. Surprisingly, no halictines [or any bees outside of the Meliponini – *Nogueirapis silacea* (Wille) and an undescribed *Proplebeia*] have been recovered yet in the roughly contemporaneous amber from southern Mexico (e.g., Engel 2004; Solórzano-Kraemer 2007) although they are to be expected in the fauna. Amber paleontologists should be diligent in their search of both Mexican and Dominican ambers for bees other than stingless bees.

Herein I describe two new halictine bees recently identified in Early Miocene amber from the Dominican Republic. One belongs to the genus *Oligochlora* Engel (Augochlorini), a group of relatively generalized augochlorines who resemble in various degrees those species of the more diverse *Neocorynura* Schrottky, as well as some species of the genera *Andinaugochlora* Eickwort and *Neocorynurella* Engel. The other species represents a distinct genus allied to *Eickwortapis* Michener & Poinar (Caenohalictini). These species are described herein to bring them to the attention of melittologists, to help more fully characterize the Miocene halictid fauna, and to encourage amber paleontologists to seek additional material. To date 14 specimens of Halictinae have been documented from Dominican amber (*visum* M.S.E.); this includes the holotypes of the 10 described species (including the two described herein), the two paratypes of *Eickwortapis dominicana* Michener & Poinar, the paratype of *Oligochlora marquettorum* Engel & Rightmyer, and an additional specimen of *O. grimaldii* Engel in the University of Kansas collection (Engel 1995, 1996, 1997, 2000; Engel and Rightmyer 2000; herein). Given that genera such as *Neocorynura* and *Augochlora* Smith are known in the Dominican amber fauna it is possible, if not likely, that other genera such as *Dialictus* Robertson, *Agapostemon* Guérin-Méneville, and even the cleptoparasitic *Sphecodes* Latreille or *Microsphecodes* Eickwort & Stage eventually could be found.

Morphological terminology for the descriptions herein generally follows that of Engel (2000, 2001, 2009) and Michener (2007), while the format for descriptions follows that used elsewhere for living and fossil Halictinae (e.g., Engel 2006a, 2006b, 2007). Metrics were made using an ocular micrometer on an Olympus SZX-12 stereomicroscope and should be considered approximate giving that the optimal viewing angle was not always achieved through the amber surfaces which could not be further prepared or polished.

Table 1. Described Dominican amber bees (higher classification after Engel, 2005).

ANTHOPHILA Latreille

Family Colletidae Lepeletier de Saint Fargeau
Subfamily Hylaeinae Viereck
Tribe Xeromelissini Cockerell
Genus *Chilicola* Spinola
Subgenus *Hylaeosoma* Ashmead
†*Chilicola gracilis* Michener & Poinar
†*Chilicola electrodominica* Engel
Family Halictidae Thomson
Subfamily Halictinae Thomson
Tribe Augochlorini Beebe
Genus *Augochlora* Smith
Subgenus †*Electraugochlora* Engel
†*Augochlora leptoloba* Engel
Genus *Neocorynura* Schrottky
Subgenus *Neocorynura* Schrottky
†*Neocorynura electra* Engel
Genus †*Oligochlora* Engel
†*Oligochlora eickworti* Engel
†*Oligochlora grimaldii* Engel
†*Oligochlora marquettorum* Engel & Rightmyer
†*Oligochlora micheneri* Engel
†*Oligochlora rozeni* Engel
†*Oligochlora semirugosa* **sp. n.**
Tribe Caenohalictini Michener
Genus †*Eickwortapis* Michener & Poinar
†*Eickwortapis dominicana* Michener & Poinar
Genus †*Nesagapostemon* **gen. n.**
†*Nesagapostemon moronei* **sp. n.**
Family Andrenidae Latreille
Subfamily Panurginae Leach
Tribe Protandrenini Robertson
Genus *Heterosarus* Robertson
†*Heterosarus eickworti* Rozen
Family Megachilidae Latreille
Subfamily Megachilinae Latreille
Tribe Megachilini Latreille
Genus *Megachile* Latreille
Subgenus †*Chalicodomopsis* Engel
†*Megachile glaesaria* Engel
Family Apidae Latreille
Subfamily Apinae Latreille
Tribe Euglossini Latreille
Genus *Eufriesea* Cockerell
†*Eufriesea melissiflora* (Poinar)
Genus *Euglossa* Latreille
†*Euglossa moronei* Engel
Tribe Meliponini Lepeletier de Saint Fargeau
Genus †*Proplebeia* Michener
†*Proplebeia dominicana* (Wille & Chandler)
†*Proplebeia tantilla* Camargo, Grimaldi, & Pedro
†*Proplebeia vetusta* Camargo, Grimaldi, & Pedro

Systematic Paleontology

Tribe Augochlorini Beebe
Genus *Oligochlora* Engel

***Oligochlora semirugosa* Engel, sp. n.**
urn:lsid:zoobank.org:act:8806981A-AC4A-4772-AD63-A508D925A7DA
Figs 1–2

Holotype. ♀, KU-DR-21 (Fig. 1); amber from the Dominican Republic (specific mine unknown), Early Miocene (Burdigalian); Fossil Insect Collection, Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas, USA.

Diagnosis. The new species is apparently most similar to *O. micheneri* Engel as evidenced by the short basal area of the propodeum which is granular and bearing minute striae along the basal margin. It can be distinguished by the rugulose integument of the genae, the dense punctation of the mesoscutum (except medially), and the obtuse dorsolateral angle of the pronotum.

Description. *Female*: Total body length 7.9 mm; forewing length 6.3 mm. Head wider than long (length 1.7 mm, width 1.8 mm); upper interorbital distance 0.83 mm; lower interorbital distance 0.73 mm. Clypeus not protruding, apical half below lower tangent of compound eyes; epistomal sulcus forming obtuse angle (Fig. 2). Preoccipital ridge rounded. Pronotal dorsolateral angle obtuse, dorsal ridge carinate; lateral angle sharply angled but apparently not carinate; tegula oval; intertegular distance 1.6 mm. Forewing with basal vein weakly arched, distad cu-a by about 4.5 times vein width; 1rs-m distad 1m-cu by about vein width; 2rs-m gently arcuate, distad 2m-cu by about eight times vein width; pterostigma relatively slender; marginal cell apex minutely truncate and feebly appendiculate; first submarginal cell longer than combined lengths of second and third submarginal cells; second submarginal cell narrow, not narrowed anteriorly; length of anterior border of second submarginal cell along Rs shorter than anterior border of third submarginal cell; length of anterior border of third submarginal cell along Rs about one-half posterior border of third submarginal cell. Hind wing with distal hamuli arranged 3-1-3. Inner metatibial spur with three branches, not including apical portion of rachis. Medioapical slit of pseudopygidial area deep.

Clypeus granular with coarse, shallow punctures separated by less than a puncture width (Fig. 2), such sculpturing on majority of supraclypeal area and face below level of antennal toruli; punctures gradually becoming smaller, more well defined, and more closely packed by level of antennal toruli such that on face above antennae integument is covered with small, contiguous punctures; punctures become more separated by ocellocular area and vertex, separated by a puncture width or less, integument between punctures granulose; gena granular with scattered small, shallow punctures, and with transverse weak rugae. Mesosoma granular throughout; mesoscutum with small contiguous punctures except on central disc punctures become more widely spaced, separated by 0.5–2 times a puncture width; median and parapsidal lines deeply impressed; mesoscutellum

Figures 1–2. Photomicrographs of holotype female of *Oligochlora semirugosa* **sp. n.** (KU-DR-21). **1** Dorsolateral oblique aspect of holotype **2** Facial aspect.

with small punctures anteriorly separated by a puncture width or less, gradually becoming more closely packed posteriorly until contiguous and irregular such that integument appears weakly rugulose; metanotum longitudinally rugulose, integument between rugae granular and impunctate; basal area of propodeum granular with short striae along basal margin, striae not reaching to one-third length of basal area, lateral and posterior surfaces of propodeum granular and apparently impunctate (difficult to discern posterior and lat-

eral surfaces); pleura coarsely punctured, punctures contiguous. Metasoma granular with small, shallow punctures separated by less than a puncture width, punctures posteriorly on more apical terga slightly elongate and forming weak longitudinal rugae, punctures fade by apical margins such that margins are strongly imbricate and impunctate; sterna apparently strongly imbricate with scattered punctures (direct view of sterna challenging).

Integument generally dull, dark metallic green (where preserved) except mandible, labrum, labiomaxillary complex, apical portion of clypeus, antenna, and tegula dark brown; legs brown. Wing membranes hyaline; veins dark brown. Metasomal terga dark metallic green, with some brighter green highlights in places; pseudopygidial area dark brown; sterna dark brown with weaker metallic green highlights.

Pubescence generally pale and scattered, slightly fuscous on inner surfaces of meso- and metatarsi; those setae on face, mesosoma, and metasoma generally simple, short to moderate in length, and erect to suberect. Scopal setae on metafemur elongate and apically plumose, moderately dense; setae on inner surface of metatibia elongate (almost as long as metatibial spurs), numerous (but not dense) and largely simple except a few in basal two-thirds apically palmate; those on outer surface somewhat shorter, more dense, thicker, and simple.

Etymology. The specific epithet is a combination of the Latin prefix *semi-* (meaning, "half" or "partial") and *rugosus* (meaning, "wrinkled").

***Oligochlora grimaldii* Engel**

Oligochlora grimaldii Engel, 1997: 98; Engel, 2001: 176.

New material. ♀; KU-DR-020; amber from the Dominican Republic (specific mine unknown), Early Miocene (Burdigalian); Fossil Insect Collection, Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas, USA.

Tribe Caenohalictini Michener

***Nesagapostemon* Engel, gen. n.**
urn:lsid:zoobank.org:act:CAFD1CF7-3C12-45CE-A3F8-CBC6F3E4C392

Type species. *Nesagapostemon moronei* Engel, sp. n.

Diagnosis. The new genus comprises large species (around a cm in length, based on the only known species at present) with the posterior surface of propodeum encircled by strong carinae; the basal area of propodeum not slanting in profile, about one-half length of vertical posterior surface (contrasting with the slanting basal area that is as long as the vertical posterior surface in the apparently related *Eickwortapis*); the metatibia densely setose, setae on inner surface elongate, longer than metatibial spurs, intermingled with long plumose setae and more elongate simple setae, setae on outer surface about as long

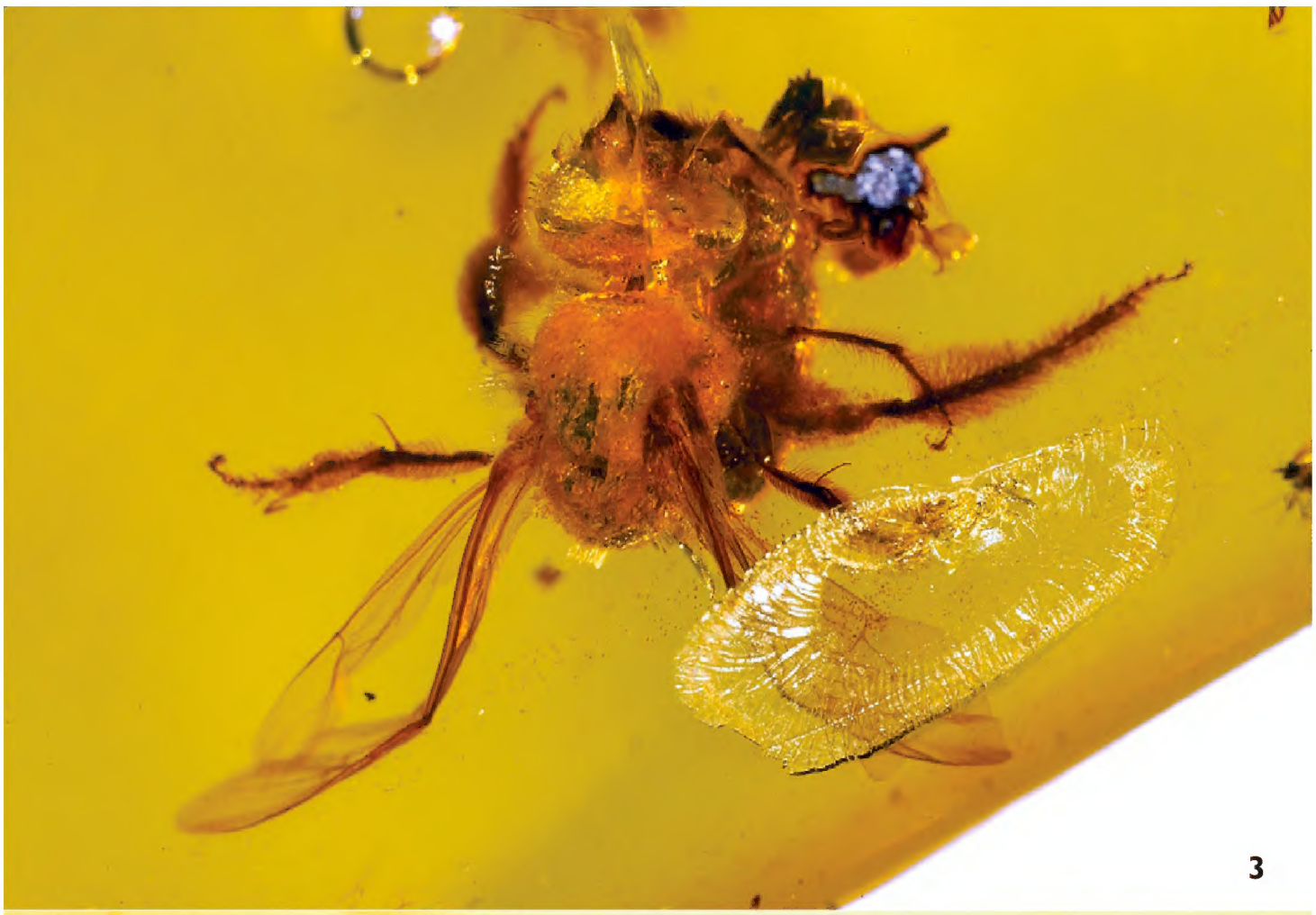
as those on inner surface and plumose [cf. Fig. 4 with figure 6 of Michener and Poinar (1996) for *Eickwortapis*]; the apex of the rachis of the inner metatibial spur hooked (not hooked in *Eickwortapis*); and the marginal cell apex acutely rounded on the anterior wing margin, with the inner border on C two times the length of the pterostigma (the same inner border in *Eickwortapis* is 1.4–1.6 times the length of the pterostigma).

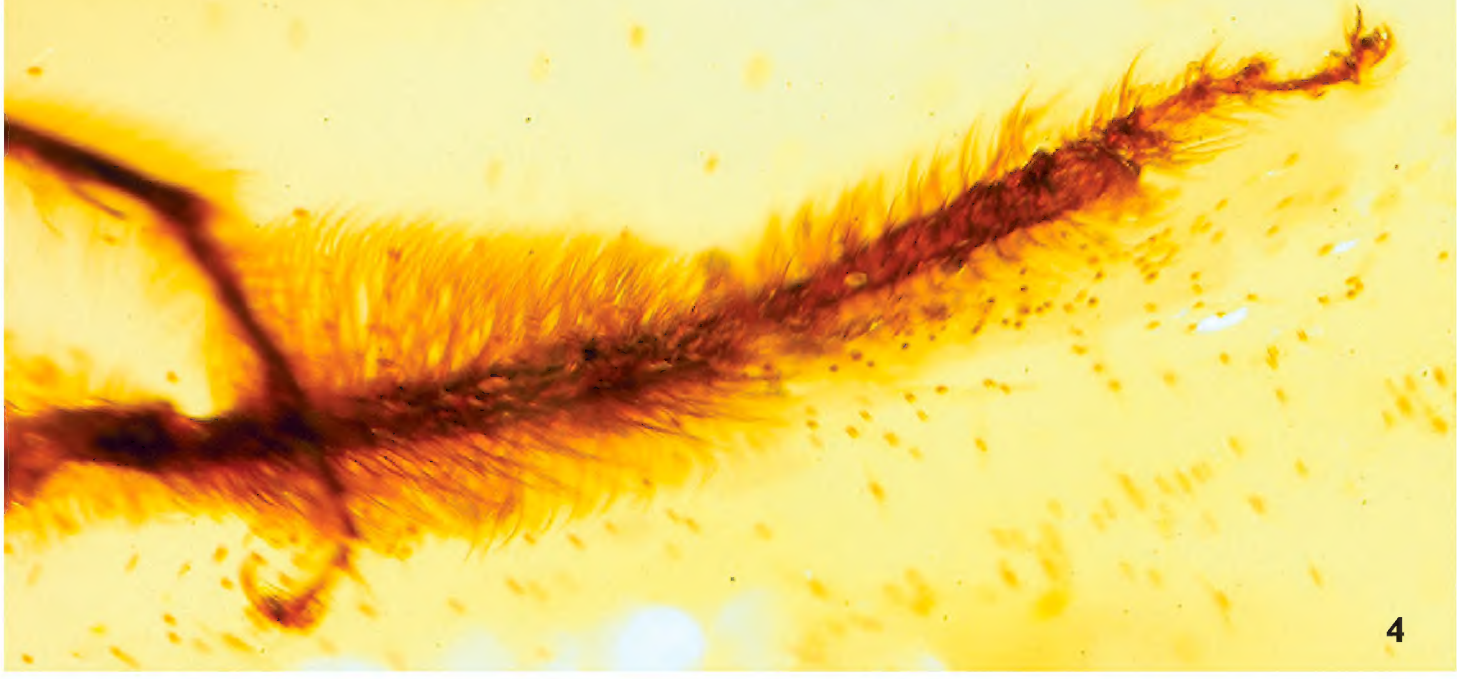
Description. *Female*: Head apparently wider than long; clypeus projecting below lower tangent of compound eyes; vertex behind ocelli very short, less than one-half diameter of median ocellus; ocellar furrow absent; preoccipital area rounded, not carinate; gena much narrower than compound eye; compound eyes not setose, converging below, inner margins concave in upper third; malar space linear. Mesoscutum not medially produced along anterior margin, broadly rounded anteriorly and not overhanging pronotum, anterior mesoscutal margin vertical, curving onto dorsal surface; mesoscutellum and metanotum convex; propodeum with dorsal horizontal surface not slanting in profile, about as long as metanotum, surface with irregular longitudinal striae extending to near posterior margin but not bordered laterally by carinae; posterior vertical surface of propodeum about twice as long as dorsal horizontal surface, laterally bordered by carinae such that posterior surface appears recessed, dorsally along border with horizontal surface surface recessed and then rounded over to horizontal surface, this ridge angled where meeting more recessed posterior-facing surface; propodeal pit on posterior surface narrow. Forewing with marginal cell apex acutely rounded, not appendiculate, length of cell along costa about twice as long as pterostigma; distal wing veins strong; first submarginal cell longer than combined lengths of second and third submarginal cells; hind wing with eight distal hamuli arranged in single, regular series. Scopal setae on metafemur dense, elongate, arched, and apically plumose; metatibia densely setose (even more so than metafemur: Fig. 4), setae on inner surface elongate, longer than metatibial spurs, intermingled with long plumose setae and more elongate simple setae, setae on outer surface about as long as those on inner surface and plumose; inner metatibial spur pectinate, branches not densely packed, apex of rachis hooked. Metasoma without setal bands (neither apical nor basal); pseudopygidial area not divided.

Etymology. The new generic name is a combination of *nesos* (Greek, meaning "island") and *Agapostemon*, a genus of caenohalictines of similar size and body proportions, and perhaps a relative. The name is masculine.

***Nesagapostemon moronei* Engel, sp. n.**
urn:lsid:zoobank.org:act:40ED15E4-965F-40D9-8E5C-BE42E23CB1E8
Figs 3–4

Holotype. ♀, MACT-1172 (Fig. 3); amber from the Dominican Republic (specific mine unknown), Early Miocene (Burdigalian); Morone Amber Collection, Turin, Italy. The holotype is preserved with three *P. dominicana* workers, one alongside the holotype's metasoma and one at each end of the piece, as well as several small flies. The holotype is not well preserved, with the several fractures around the metasoma, which





Figures 3–4. Photomicrographs of holotype female of *Nesagapostemon moronei* **gen. n. sp. n.** (MACT-1172) **3** Dorsal aspect of holotype **4** Detail of extended (right) metatibia and metatarsus.

itself is curved under the remainder of the body, and much of the bee is covered in minute air pockets, fractures, and some orangish debris such that glimpses onto the integument are challenging, but possible.

Diagnosis. As for the genus (*vide supra*).

Description. As for the genus with the following additions: *Female*: Total body length 9.9 mm; forewing length 6.9 mm. Head width 2.4 mm; apparently wider than long although a direct frontal view of the face is not possible in the holotype. Forew-

ing with basal vein strongly arched, distad cu-a by 1.5 times vein width; 1rs-m distad 1m-cu by about three times vein width; 2rs-m gently arcuate, distad 2m-cu by about six times vein width; first submarginal cell longer than combined lengths of second and third submarginal cells; second submarginal cell relatively square, length of anterior border of second submarginal cell along Rs as long as abscissa of Rs forming its proximal border and about as long as r-rs, slightly shorter than anterior border of third submarginal cell; anterior border of third submarginal cell along Rs about two-thirds length of posterior border. Inner metatibial spur with three branches (not including apical portion of rachis).

Sculpturing of head and mesosoma apparently with coarse punctures separated by less than a puncture width, integument between apparently smooth and shining, those punctures of mesosoma larger than those of head. Metasomal terga granulose with coarse, shallow punctures separated by a puncture width or less (owing to preservation best seen laterally in holotype when viewed from above as metasoma is slightly twisted exposing the terga; in ventral aspect the central portions of the terga are largely covered with fine debris); apical margins of terga apparently impunctate and strongly imbricate; metasomal sterna not easily visible.

Integumental coloration obscured by layers of air in most places giving a silvery reflection. In places where integument is more easily seen (small places on face, vertex, gena, metasoma laterally, and some of the sterna) apparently head and mesosoma metallic except antenna dark brown and tegula translucent brown, while metasomal terga dark brown with weaker metallic green highlights, sterna dark brown without highlights. Wing membranes hyaline; veins brown. Legs dark reddish brown.

Etymology. The specific epithet is a patronymic honoring Dott. Ettore Morone in recognition for his support of my studies and his many generous kindnesses.

Provisional Key to the Dominican Amber Halictidae

The following provisional key is based on females only as the male of *E. dominicana* is the only halictine male presently documented from Dominican amber.

1. Pseudopygidial area without medioapical slit; posterior surface of propodeum encircled by strong carinae (Caenohalictini) **2**
– Pseudopygidial area with medioapical slit; posterior surface of propodeum not encircled by strong carinae (Augochlorini) **3**
2. Small species (length about 5 mm); basal area of propodeum slanting in profile, as long as vertical posterior surface; metatibia with scattered moderate-length setae, setae with a few apical branches, those on inner surface distinctly longer than those on outer surface; apex of rachis of inner metatibial spur not hooked; marginal cell apex sharply pointed on anterior wing margin, inner border on costa 1.4–1.6 times length of pterostigma ..... ***Eickwortapis dominicana* Michener & Poinar**

– Large species (length about 9.9 mm); basal area of propodeum not slanting in profile, about one-half length of vertical posterior surface; metatibia densely setose, setae on inner surface elongate, longer than metatibial spurs, intermingled with long plumose setae and more elongate simple setae, setae on outer surface about as long as those on inner surface and plumose [cf. Fig. 4 with figure 6 of Michener and Poinar (1996)]; apex of rachis of inner metatibial spur hooked; marginal cell apex acutely rounded on anterior wing margin, inner border on costa 2 times length of pterostigma..... ***Nesagapostemon moronei* gen. n. sp. n.**

3. Epistomal sulcus outside of subantennal sulci forming obtuse angle; inner metatibial spur pectinate..... **4**

– Epistomal sulcus outside of subantennal sulci forming small, acute angle; inner metatibial spur simple, serrate..... ***Augochlora leptoloba* Engel**

4. Anterior border of mesoscutum broadly and gently rounded, not projecting over pronotum..... **5**

– Anterior border of mesoscutum narrowed medially and projecting over pronotum..... ***Neocorynura electra* Engel**

5. Basal area of propodeum dull and granular or imbricate, with or without short basal striae, never smooth, polished, and shining..... **6**

– Basal area of propodeum smooth and shining, without striae..... ***Oligochlora eickworti* Engel**

6. Basal area of propodeum without minute basal striae..... **7**

– Basal area of propodeum with minute basal striae..... **9**

7. Pronotal dorsolateral angle orthogonal; basal area of propodeum granular..... **8**

– Pronotal dorsolateral angle obtuse; basal area of propodeum imbricate..... ***Oligochlora marquettorum* Engel & Rightmyer**

8. Smaller species (total body length under 7.5 mm); inner metatibial spur with three branches (not including apical portion of rachis)..... ***Oligochlora grimaldii* Engel**

– Larger species (total body length over 8 mm); inner metatibial spur with four branches (not including apical portion of rachis)..... ***Oligochlora rozeni* Engel**

9. Pronotal dorsolateral angle orthogonal; gena granular, without rugae; mesoscutum granular and largely impunctate..... ***Oligochlora micheneri* Engel**

– Pronotal dorsolateral angle obtuse; gena granular and transversely rugulose; mesoscutum granular with contiguous punctures except punctures more widely spaced medially..... ***Oligochlora semirugosa* sp. n.**

Acknowledgements

I am grateful to Dott. Ettore Morone for hosting my visit to Turin and for permitting me to study material in his collection; to two anonymous reviewers for constructive comments on the manuscript; and to Keith Luzzi and Dave Grimaldi for bringing to

my attention two additional augochlorines (one of *O. grimaldii* and the other described herein as *O. semirugosa*). Support for this work was provided by National Science Foundation grants EF-0341724 and DEB-0542909 (both to M.S. Engel). This is a contribution of the Division of Entomology, University of Kansas Natural History Museum.

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